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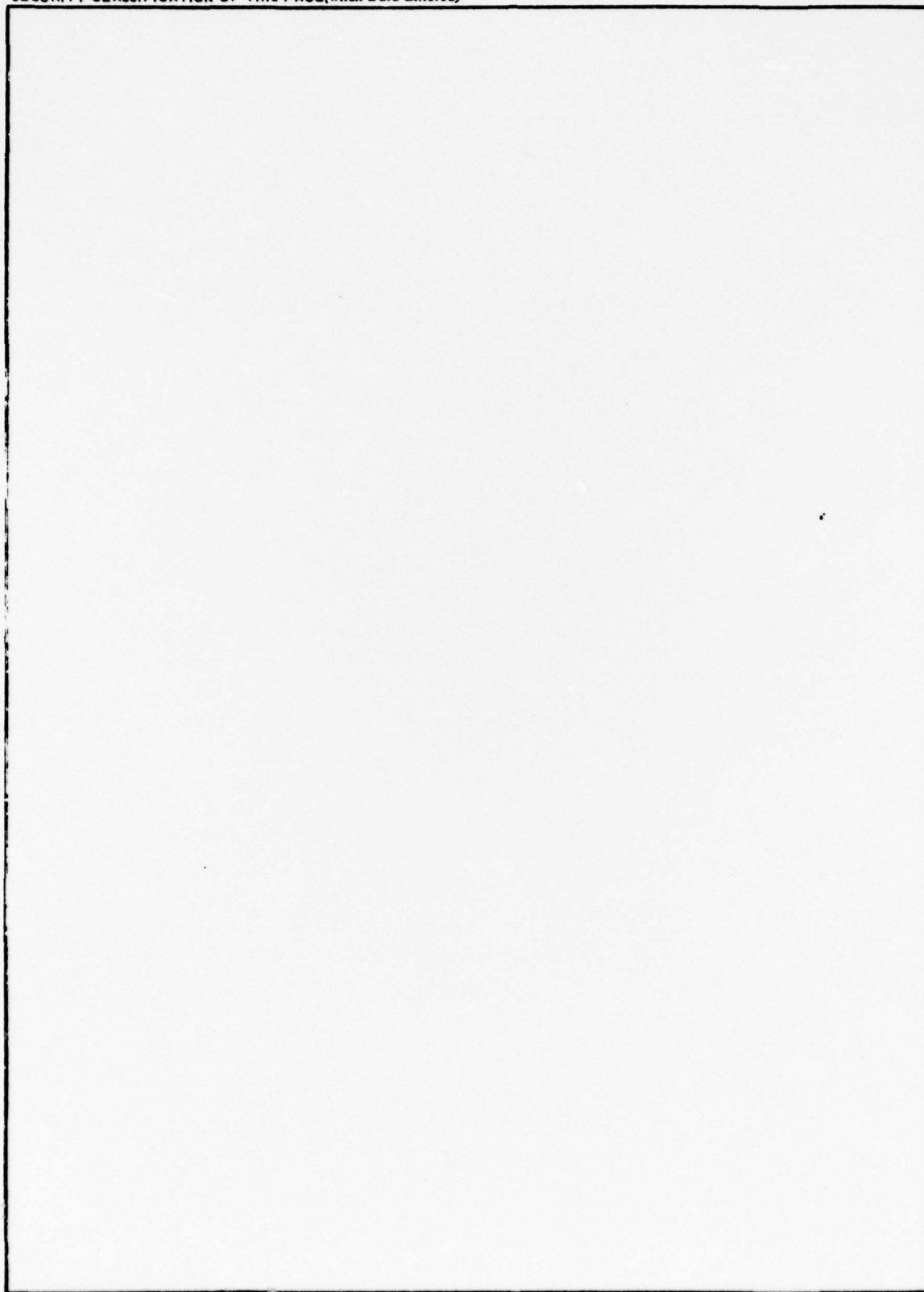
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1. INTRODUCTION

This report covers progress in message technology under the contract "Message Technology Research and Development" for the period 2 October 1976 through 2 January 1977

This work is a continuation of work on MAILSYS/HERMES performed under the ARPA Contract "Distributed Computation and TENEX Related Activities" during 1975.

During the October through December quarter, the primary effort of the HERMES project was directed toward preparation for the DARPA/NAVY/CINCPAC text (the Military Message Experiment or MME).

We continued implementation of a simulated demonstration version of the multilevel secure CINCPAC version of the HERMES system. We also continued the implementation of the interface between the HERMES system, running on the TENEX operating system, and the LDMX.

Our preparations for the MME included the continued implementation of a facility for creating new types of message fields on demand, a facility for attaching comments to received messages, and a scope-oriented text editor suitable for use with the MME scope terminals. We improved the facility for creating named subsets of messages within message-files, and for querying

the system to determine which subsets include particular message or group of messages. We provided a new group of alternative modes of operation for the HERMES system, according to the preferences of individual users. We also continued the development and improvement of other aspects of the HERMES system, such as documentation and the details of command structure, which will be of value to both the CINCPAC-HERMES users and the general user community.

Our secondary effort during this period was to extend the facilities of the generalized HERMES system in parallel with the developments required for the CINCPAC-HERMES system, and to make these facilities available to our users on the ARPANET and elsewhere. We therefore developed two experimental versions of the HERMES system, the CINCPAC-HERMES system with the simulated security features, and the compatible "civilian" version.

Security for the MME

During this quarter, our efforts were concentrated on the implementation of a simulated multi-level secure environment for the MME version of the HERMES Message System. The object was to create a system that would have the same user interface as the projected secure HERMES system. Security would be simulated by causing message-fields to carry security labels, and by providing

commands within HERMES for changing security level. The user would not be given access to the TENEX operating system, so that all file-handling and other TENEX functions would be brought inside HERMES. Specifically, both message-files and files containing unstructured text would be handled in the same manner as HERMES objects, such as sequences and templates.

User-Created and Comment Fields

We have implemented two facilities that promise to be of considerable utility in military and other specialized applications of the HERMES message system. User-created fields allow the user to create his own message-fields in four datatypes: one-line text fields, multi-line text fields, addressee fields and date fields. New user-fields may be declared through the use of a special user-field editor. Alternatively, user-fields in incoming messages may be added to the user's collection through the use of the EXPLODE command.

The COMMENT command in the message-editor allows the user to create a comment-field corresponding to any standard message-field or any user-field, whether or not the field happens to be filled in. The comment field is always of the multi-line text type and is automatically marked with the user's name and the date.

The message to be commented upon is either created in the message-editor or placed there through the use of the EXPLODE command.

Refile and Redistribute Commands

We have designed and partially implemented two facilities for circulating messages in the draft state, where it is desired not to cause copies to be sent to the names (or files) in the To, Cc, Bcc or Fcc fields. These facilities will be required in the MME environment where messages from outside the CINCPAC organization must be transferred from one user to another within CINCPAC before final action is taken on them.

The REFILE command places the draft message in the user's message-file, either as a replacement for, an existing message or at the end of the file.

The REDISTRIBUTE command acts upon a message in the user's message-file, and is similar to the FORWARD except that it does not wrap the message in a new "envelope". All fields of the original message remain accessible for searching, filing, etc.

Design work was completed on a new implementation of the auxiliary files used to aid the handling and searching of HERMES message-files. The new design will substantially speed up the time required to input a message-file into the HERMES system and

will greatly increase the maximum number of messages that can be entered in a single message file. The time required to search message-files will also be considerably decreased.

The Scope Editor

The WE Editor for the HP2640/45 Scope terminals has been installed in the two versions of the HERMES system and has undergone extensive testing by BBN and MITRE personnel. The modular nature of the WE program has allowed alternative patterns of interaction between the terminal and the user to be evaluated.

Increasing The Convenience And Usefulness Of Sequences

Two new commands, ADD and WHEREIS, have increased the usefulness of user-created sequences within message-files.

The top-level ADD command allows the user to add any group of messages to an existing user-created sequences. This facility allows the user to place messages in named sequences, which can be thought of as corresponding to "file-folders" within a message-file, as easily as he can file them in separate message-files.

The WHEREIS command allows the user to query the system to find out which sequences any given message, or group of messages, belongs to. Both commands are implemented so as to give maximum

generality and flexibility in specifying messages and named sequences.

Structured Documentation

We have designed and partially implemented a structured documentation facility consisting of a set of topics with associated examples. The topics are organized in a structured outline, and the documentation commands allow the user to review the outline to varying levels of depth, in broad outline, or in narrow detail. Documentation can be output to the user's terminal, to a line-printer, or to files. The user can specify the output of small sections of text, or can cause HERMES to generate a multi-page document with a title page and an outline serving as a table of contents.

The "Lifestyle" Switches

We have implemented two new switches which provide a means for causing the HERMES system to generate automatically the types of command completion and helpful "noise words" provided by the Escape-key in the TENEX Operating System and in previous versions of HERMES.

Statistics on Hermes Use

We have continued to collect and analyze statistics on HERMES usage.

Impact of Message Technology on Naval Operations

The Human Factors group completed a revision of the "Organization Impact Protocol" specifying questions suitable for administration by interview and questionnaire and covering the following topics:

Communication and decision making.

Job satisfaction.

Work facilitation.

Role relations and role strain.

The formal message system.

Formal and informal organization structure.

2. IMPROVEMENTS TO THE HERMES SYSTEM

In the developmental versions of HERMES, we have augmented the flexibility of the system by implementing user-created fields and the ability to comment of any message field. Messages can be refiled from the message editor into the current message-file, and redistributed from the message-file without activating the fields accessed by the normal SEND mechanism.

2.1 User-Fields and Comment Fields

User-fields allow the user to tailor HERMES to meet specific needs. User-fields can be treated exactly like other message-fields; they can be used in outgoing messages and in templates, and they can be commented upon. All user-fields may be searched with filters.

User-fields are stored as a group in a current object named USER-FIELDS.

```
>SHOW USER-FIELDS<CR>
APHORISM-()
HERMES-(PEOPLE)
REMINDER-(TEXT)
```


New user-fields may be created:

- a) by using the USER-FIELDS-EDITOR.
- b) by using the EXPLODE command. Whenever a message in the current message-file is exploded, any user-fields it contains are added to the collection in USER-FIELDS.
- c) by using the COMMENT command to create a Comment-field.

A User-Field may be created as one of four datatypes: LINE, ADDRESSEE, DATE or TEXT.

2.1.1 LINE-Type User-Fields

Syntax: <name>
 <name>-() <one-line text> <CR>
 <name>-(LINE)

This is a one-line text field, like the Subject:-field. It may contain any text and is terminated by a <CR>. If you do not specify the datatype of a user-field, LINE-type is assumed.

Examples:

>PROVERB: Brevity is the soul of wit.<CR>
>APHORISM-(): Infinite riches in a little room.<CR>
>FULLNAME-(LINE): Douglas W. Dodds, Jr.<CR>

2.1.2 ADDRESSEE-Type User-Fields

Syntax: <name>-(ADDRESSEES)
 <name>-(ADDR) <addressee-list> <CR>
 <name>-(PEOPLE)

This is an address-field, similar to the To:-field. It may contain any list of addressees, separated by commas. A <CR> terminates the field. User-Fields of the ADDRESSEE type do NOT cause messages to be sent to the addressees in the User-Field, but are useful for sending address lists to other message-system users.

Examples:

```
>BBNA-(ADDRESSEES): @BBNA,MOOERS,MYER,STEVENS<CR>
>BBNF-(ADDR): @BBNF,DODDS,HENDERSON,JMILLER,ULMER,VITTAL<CR>
>HERMES-(PEOPLE): @BBNF,HENDERSON,JMILLER,DODDS,
                  @BBNA,MOOERS,STEVENS,MYER<CR>
```

2.1.3 DATE-Type User-Fields

Syntax: <name>-(DATE:) <date> <CR>

This is a date field. It may contain only a single date. A <CR> terminates the field.

Examples:

```
>BICENTENNIAL-(DATE): July 4, 1976<CR>
```

2.1.4 TEXT-Type User-Fields

Syntax: <name>-(TEXT) <multi-line text> <CTRL-Z>
[<name>]

This is a multi-line text field, like the Text:-field. It may contain any text and must be terminated with <CTRL-Z>. User-Fields of the TEXT type may be searched with filters.

All fields created with the COMMENT command are TEXT-type fields, with the name of the field commented upon in square brackets.

Examples:

```
>>REMINDER-(TEXT)(to ^Z) <CR>
```

```
REMINDER-(TEXT):
```

```
    You must answer this message
    by the end of the week.
    <CTRL-Z>^Z
```

```
Format?: N<CR>
```

```
>COMMENT REMINDER-(TEXT)<CR>
```

```
[REMINDER-(TEXT)]: Note by MOOERS on 1 JAN 1977 1624-EST
                   Past due.<CTRL-Z>^Z
```

```
Format? N<CR>
```

2.1.5 The User-Fields Editor

The general-object-editing-commands, EDIT, DONE, ABORT, SHOW, and ERASE are available to modify USER-FIELDS.

The ERASE command selectively removes individual field names:

```
>ERASE <field name><CR>
```

In addition, the specialized-object-editing command, DECLARE, is available to create new user-fields.

Example:

```
>EDIT USER-FIELDS<CR>
>>SHOW<CR>
  REMINDER-(TEXT)
  TIME-(LINE)
```

USER-FIELDS now contains two user-fields.

```
>>DECLARE HERMES-(PEOPLE)
>>DECLARE PROVERB-(TEXT)
>>SHOW<CR>
  REMINDER-(TEXT)
  TIME-(LINE)
  HERMES-(PEOPLE)
  PROVERB-(TEXT)
```

The two DECLARE commands have caused two new user-fields to be added.

2.2 The COMMENT Facility

Syntax: >>COMMENT <field-name> <CR>
Default: >>COMMENT Text:

COMMENT creates Comment-Fields in the MESSAGE-EDITOR. If you wish to comment on a message in your message-file, EXPLODE the message to insert it in the current draft message.

COMMENT adds a new field to the message, marked with your name and the date. Comment-fields are user-fields of the TEXT type.

Since the original message is EXPLODED, any of the original message-fields may be changed by the person adding comments. To preserve accountability, the EXPLODE command does not preserve the original Sender:, Date: and Message-ID: fields, although it does preserve the original From: field. New Sender:, Date: and Message-ID: fields are automatically created when the message is refiled or sent.

It is not necessary to have a filled-in field, or indeed any content at all in the MESSAGE-EDITOR, in order to create a comment field.

```
>>COMMENT<CR>
(Type comment to ^Z)
[TEXT]: Note by MOOERS on 20 Dec 1976 1229-EST
      This is an example of a comment on a Text: field.<CTRL-Z>
>>COMMENT SUBJECT<CR>
[SUBJECT]: Note by MOOERS on 20 Dec 1976 1233-EST
      This is an example of a comment on a Subject:
      field.<CTRL-Z>

>>COMMENT KEYWORDS<CR>
[KEYWORDS]: Note by Mooers on 20 Dec 1976 1237-EST
      There is no Keywords field in this
      message.<CTRL-Z>
```

2.3 The REFILE Command

REFILE will place the contents of the CDRAFT (in the message editor) in the <message-no.> slot in the current message-file. The message previously in the <message-no.> slot will be deleted, but the user will be shown a survey first and allowed to abort the command.

The REFILE command will make it possible to comment upon a message and replace it in the message-file.

2.4 The REDISTRIBUTE Command

HERMES will allow you to redistribute a message without wrapping it up in a jacket (like FORWARD) or changing the Sender:, Date:, and Message-ID fields (like EXPLODE).

The message that arrives after redistribution will consist of the original message with the addition of three new fields:

```
Redistributed-To: <addressee-list>  
Redistributed-By: <connected directory> <login directory>  
Redistributed-Date: <date>
```

The message will also have acquired an additional "Mail from ..." line which will help identify the host from which it was redistributed.

2.5 Changes in Template Items and Fixed Templates

The template facility has been revised to accomodate the new user-fields and comment-fields.

The template item "Verbatim:", which printed the incoming message in one chunk, has been abolished.

The new template item "Standard:" prints the fields of the message as transmitted in a standard order. "Standard:" is identical to the new fixed template named STANDARD.

The template item "User-Fields:" prints all User-Fields in the message, whether or not they exist in USER-FIELDS.

The template item "Other:" continues to print the "Mail from ..." lines and any fields which are not recognized by the HERMES system.

The fixed templates have been renamed to tie them to the commands for which they are designed. They are

SURVEY-FORM	formerly	BASIC-SUMMARY
PRINT-FORM	"	RCVD-FORM and STANDARD
LIST-FORM	"	FULL-LISTING
COMPOSE-FORM	"	BRIEF-COMPOSE
STANDARD	(new)	
INCLUDE-FORM	"	

When a message is included in the text of another message, by use of the Forward or Include command, the included message is printed through the ITEMPLATE, which is initially set to INCLUDE-FORM. INCLUDE-FORM contains only the new template item "Standard:"

2.6 Automatic Profile

A new switch, tentatively named the PROFILE-MODE-SWITCH, has been added. This switch allows a "desk top" style of operation in which filters, templates, destinations, user-fields and switch

settings, are automatically saved until your next session just like your sequences. There is no need to "Export" or "Import" to or from the Profile.

If the switch is set so there is no Automatic Profile, you may still save an object in your Profile by giving the EXPORT command.

3. IMPROVED DESIGN FOR HANDLING MESSAGE-FILES

We have completed a design for a new format for the stored "companion" files that accompany the HERMES message-files. These files are called "index" or "parseq" files because they hold information about the "PARse" of each message, i.e., the location of the different fields within the message, and they are also used to store the permanent named SEquences which the user creates for each message-file.

Currently when a message-file is accessed by the HERMES system, the entire parseq file is read into the active memory where it is transformed and stored as an internal table. The new implementation will change the format of the parseq file so that the file as stored is identical in form to the file in active memory. Because no transformation is required, HERMES is able to map segments of the file, rather than the complete file, into active memory. Each segment corresponds to 500 messages.

Under the old implementation, a message-file was limited to 1500 to 2000 messages. The new implementation has an absolute upper limit of 2000 of the 500-message segments, or 1,000,000 messages.

4. THE SCOPE EDITOR

The WE Scope Editor was implemented for use on HP 2040 and HP 2045 scope terminals, in both the regular and MME version of the HERMES system.

The design of the WE Editor was reported in detail in the previous progress report.*

Extensive testing was performed by members of the HERMES group and by MITRE personnel.

Several patterns of interaction between user and terminal were explored and different patterns of assigning functions to the function keys were generated.

*"Message Technology Research and Development", Quarterly Progress Report No. 3, 2 July 76 to 20 October 76, BBN Report No. 3440.

5. APPLICATIONS-LEVEL SECURITY FOR THE MME

A partial implementation of the MME-oriented version of HERMES, with simulated security, and with the new fast message-file handling, was installed on the BBNA, BBNF and ISIA computers for use by a limited group of users. A companion version without the simulated security was installed on the same hosts to allow user to switch back and forth and compare the user interface of the two systems.

The security commands consist of the commands that change the security level of top-level HERMES and of the message-editor:

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and three semi-experimental commands:

Maximum-Security-Level <security-level><CR>

Sets the maximum security level that the user can reach.

>SetScopeMode <CR>

This is a toggle which turns on and off the special features available for the HP2640 and 2645 terminals.

>SetSecureOutput<CR>

This is another toggle which turns on and off the facility that sends messages with security. Each message-field is labelled with a security designation; for example, Subject[U]: or Text[T]:. Fields so labelled are treated as user-fields by the regular HERMES system, and not printed by the regular "Subject:" and "Text:" template items. HERMES initially sets SetSecureOutput to OFF, causing messages to be sent without security labels.

6. SELF-CONTAINED HERMES FILE-HANDLING

We began the design and implementation of a facility for performing all aspects of file-handling entirely within the HERMES system. The goal is to isolate the user from the TENEX operating system entirely.

Message-files and files containing unstructured text will be given HERMES names, and will be recognized and extended using the same conventions as ordinary HERMES objects, such as sequences and templates. HERMES commands will allow users to create, show and delete files within the HERMES system. All other operating system functions, such as connecting to another directory, will also be brought within the HERMES system.

7. HUMAN FACTORS

We prepared a second draft of the "Organization Impact Protocol" dated 14 September 1976. A number of questions from the first draft were discarded, primarily because of their sensitivity. This results in the elimination of the "Motivation" section and in a sharp attenuation of data concerning impact on work groups and of respondents' evaluation of their organizational environments. It contains no justification for the questions used. It does specify questions suitable for administration by interview and questionnaire, respectively. The draft covers the following topics: communication and decision making, job satisfaction, work facilitation, role relations and role strain, the formal message system, and the informal and formal organization structure.

As to logistics, at this writing it appears that there is the opportunity for about one-half hour's worth of questionnaire time for organization impact and the opportunity to discuss the questionnaires with all respondents verbally in advance. However, there would be time to interview only about a 50 percent sample. The material submitted here would consume something under an hour of interview time and 35 to 40 minutes of questionnaire time.

Most of the following questions are now in acceptable form for pretesting, but answer categories are still missing. Also, certain concepts and terms are yet unresolved. At issue are such concepts as effort devoted to the output of CINCPAC as an organization vs. effort devoted to the maintenance of the organization, formal vs. informal communication, and the nature of communication effort. Some terms at issue are the name of CINCPAC's current message system, the name of the proposed system; and the term used to designate a "work group."

Steps necessary to bring this protocol to a full level of usefulness include editing the material to fit specific field test procedures and pretesting.